MISCELLANEOUS CONCRETE ITEMS

This manual (in the next 5 chapters) will discuss the construction and inspection of various types of curbs, sidewalks, curb ramps, steps, concrete approaches, paved side ditches, concrete gutters, and concrete median barriers. The dimensional requirements will be shown as well as the specification requirements. Construction procedures learned in the field that may not be covered in other State-provided written materials will also be discussed.

CHAPTER 5

CURBS

Introduction

Curbs are used to channelize both traffic and water. They are mainly used in or near urban areas where traffic speeds are low. Curbs are also used in rural areas where traffic speeds are higher but usually only in conjunction with guardrail, since a curb by itself can be hazardous in this situation.

Curbs vary in exposed height with the higher curbs providing more traffic restriction abilities and allowing for future resurfacing without losing all of the curb exposure.

COMBINED CURB AND GUTTER

Curb Types

The various types of curbs are shown on Standard Sheets E605-CCSJ-01, E605-CCCG-01, and E605-CCIN-01. The various types are listed as follows.

1. CURB – This is a free standing curb, 20 inches in height with the top six to eight inches exposed. It is hard to maintain good drainage with this type of curb where grades are relatively flat.

2. COMBINED CURB AND GUTTER – This type of curb with a gutter is good for maintaining drainage where grades are relatively flat. There are three types of combined curb and gutter:

- --COMBINED CONCRETE CURB AND GUTTER has a six inch exposure.
- --COMBINED CONCRETE CURB AND GUTTER, TYPE B (MOUNTABLE) has a four inch exposure.
- --COMBINED CONCRETE CURB AND GUTTER, TYPE C has an eight inch exposure.

3. INTEGRAL CURB – This type of curb is used in conjunction with concrete pavement. The curb base is normally poured monolithic with the pavement. Stirrup bars are placed in the curb base concrete at the time the pavement is placed. The exposed portion of the curb is then placed over the base with the stirrup bars permanently connecting the two parts. There are three types of integral curbs:

- --INTEGRAL CONCRETE CURB has a six inch exposure.
- --INTEGRAL CONCRETE CURB TYPE B (MOUNTABLE) has a four inch exposure.
- --INTEGRAL CONCRETE CURB TYPE C has an eight inch exposure.

4. INTEGRAL CURBWALK – This type of curb is poured monolithic with a sidewalk. It is seldom used now and if specified, it would be detailed in the plans as it is no longer included in the Standards.

5. CEMENT CONCRETE CENTER CURB – This type of curb is used mainly to separate traffic. There are four types of center curb; Types A, B, C, and D; each having a different exposed height as shown on Standard Sheets E605-CNCC-01 through E605-CNCC-03.

Curb Types (cont'd)

6. BITUMINOUS CONCRETE CURB – Bituminous curbs are seldom used, however, when they are, there are three types that may be used. One is called a bituminous curb and the others are called Bituminous Center Curb Type A and Bituminous Center Curb Type B. They are all shown on Standard Sheets E605-CCSJ-01, E605-CNCB-01, and E605-CHCB-02. The bituminous curb is usually placed on bituminous pavement to separate traffic.

Bituminous curbs are easily damaged by snowplows and are best used on a shoulder where guardrail will be placed. When bituminous curbing is placed on a paved shoulder or pavement, the surface upon which the curb will be placed must be cleaned and tacked as specified in Section 605.07(b) of the Standard Specifications. The bituminous curb mixture shall be HMA Surface Type A in accordance with Section 402 and 605(c) and shall be placed with a bituminous curb machine or paver with a curb attachment.

Bituminous curb is considered unsatisfactory if it has any of the following characteristics:

* incorrect alignment
* poor density
* improper section
* does not meet straight edge requirements of ¼ inch in 10 feet

Curb having any of these characteristics should be removed immediately while it is still hot and replaced with curb that meets specifications.

Precast Concrete Curb

If a precast concrete curb is specified, it will be detailed in the plans as it is seldom used and no longer included in the Standards. The only curb of this type that has been used recently is the type you may have seen used in parking lots. The curb was used to retain soil at a turn lane. These were standard production precast curbs.

The placement requirements for precast curbs would be specified in the plans or proposal. The only Standard Specifications that would apply to precast curb would be the applicable portions of section 605.03 that are not in conflict with the plans or proposal.

Cast in Place Cement Concrete Curb

Cast in place curb is predominately used today. It is placed using forms or with a slipform curb machine. Either method will produce a good finished product if the workmen are sufficiently experienced. It should be noted that all of the cement concrete curbs shown on the Standard Sheets are constructed using these methods.

Grade Preparation

The subgrade shall be cut so that the required curb grade is obtained when the curb is placed. Any soft or yielding material shall be removed and replaced with suitable material. The curb subgrade shall be compacted to a firm even surface. Although there are no specific density requirements, soft or non-compacted areas will allow the curb to settle causing water to pond. For this reason, the technician should observe the compactor during this operation to determine if any correction is required.

Forms

Curb forms may be made of wood or metal. They must be straight and free of warping. The forms must extend for the full depth of the curb and secured so that they will maintain the correct grade and alignment.

FORMS

Cement Concrete Curb Machines

Concrete curb machines may be used provided they produce curb that meets the specifications. Curb machines use low slump concrete and vibration for consolidation and, therefore, produce a strong curb. If properly used, curb machines can now produce a concrete curb superior to formed curb.

CEMENT CONCRETE CURB MACHINE

Concrete Composition & Placement

Integral curb or integral curb and gutter usually has the portion below the surface of the pavement poured with the pavement. The concrete used for this purpose is paving concrete as specified in the 500 section of the Standard Specifications. All other concrete for curb, integral curb, and integral curb and gutter shall be class A concrete. It shall meet all of the requirements of section 702 of the Standard Specifications.

After the concrete is placed in the forms it shall be consolidated by tamping, spading, or vibrating. Forms should be left in place until the concrete has set sufficiently so that their removal will not cause damage to the curb surface or cause it to slump.

After the forms are removed, the exposed surfaces shall be rubbed immediately to a uniform surface. Curb machines use vibrators for consolidation and as little hand finishing as possible should be done behind the machine. Excess hand finishing in conjunction with a curb machine can cause the curb to slump or be pushed out of alignment. A fine broom finish is normally used which produces an acceptable finish for either formed or machine placed curbs.

Joints

Pavement joints shall be continued through integral concrete curb. Pavement contraction joints will be continued through integral concrete curb with preformed joint material ¼ inch thick.

JOINT MATERIAL BEING PLACED AT CASTING IN CURB

Joints (cont'd)

Curb that is not integral shall have joints at ten foot intervals. These joints may be sawed or formed at a depth and width as shown in the plans or standards. Preformed expansion material shall be placed at the beginning and end of all radii and at castings. This material should be ¼ inch thick.

Curing

As soon as the finishing of the curb is complete it shall be cured by being kept wet for three days or cured with liquid membrane curing compound as used for pavement.

APPLYING CURING COMPOUND

Additional Requirements for Cement Concrete Center Curb

The subgrade shall be prepared the same as the adjacent pavement. If the adjacent pavement has subbase, it shall be carried through the full width of the center curb and at the same thickness. If the adjacent pavement is cement concrete, 3/8 inch thick expansion joint material shall be placed in the center curb opposite the contraction joints in the pavement. If the center curb is adjacent to bituminous pavement, these 3/8 inch expansion joints will be placed at 40 foot intervals with intermediate joints at eighteen foot intervals cut to 1/3 the depth of the curb.

A minimum 3/8 inch thick expansion material should also be placed at the beginning and end of all concrete center curb where the ends are adjacent to concrete pavement, however, experience has shown that a one inch expansion joint is preferable.

Construction Inspection Procedures	All dimensions of curbs should be checked for compliance to the plans and standards. The tops and faces of all curbs should be checked with a straight-edge to check the ¼ inch in ten feet tolerance. With experience, a visual inspection can reduce this checking to areas that appear to be out of tolerance. All curb that does not meet the straight-edge requirement shall be removed and replaced. All materials should be checked for compliance to the specification as noted in the Frequency Manual.
Measurement & Payment	Curbing shall be measured by the linear foot along the front face. Curb and gutter will be measured along the face of the curb. No deduction will be made for castings installed in the curbing. Center curb will be measured by the linear foot or by the square yard as specified in the plans. Curbing will be paid by the linear foot for each kind and type specified.